

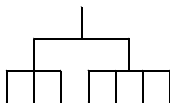
Agilent 33120A

Function / Arbitrary Waveform Generator

Quick Reference Guide

Front-Panel Menu Reference

Use *Recall Menu* as a shortcut to recall the last command executed.



A: MODulation MENU

1: AM SHAPE ⇒ 2: AM SOURCE ⇒ ••• ⇒ 9: FSK RATE ⇒ 10: FSK SRC

- | | |
|---------------|--|
| 1: AM SHAPE | Selects the shape of the AM modulating waveform. |
| 2: AM SOURCE | Enables or disables the internal AM modulating source. |
| 3: FM SHAPE | Selects the shape of the FM modulating waveform. |
| 4: BURST CNT | Sets the number of cycles per burst (1 to 50,000 cycles). |
| 5: BURST RATE | Sets the burst rate in Hz for an internal burst source. |
| 6: BURST PHAS | Sets the starting phase angle of a burst (-360 to +360 degrees). |
| 7: BURST SRC | Selects an internal or external gate source for burst modulation. |
| 8: FSK FREQ | Sets the FSK "hop" frequency. |
| 9: FSK RATE | Selects the internal FSK rate between the carrier and FSK frequency. |
| 10: FSK SRC | Selects an internal or external source for the FSK rate. |

B: SWP (Sweep) MENU

1: START F ⇒ 2: STOP F ⇒ 3: SWP TIME ⇒ 4: SWP MODE

- | | |
|-------------|---|
| 1: START F | Sets the start frequency in Hz for sweeping. |
| 2: STOP F | Sets the stop frequency in Hz for sweeping. |
| 3: SWP TIME | Sets the repetition rate in seconds for sweeping. |
| 4: SWP MODE | Selects linear or logarithmic sweeping. |

C: EDIT MENU *

1: NEW ARB ⇒ [2: POINTS] ⇒ ••• ⇒ [6: SAVE AS] ⇒ 7: DELETE

- | | |
|-------------------|---|
| 1: NEW ARB | Initiates a new arb waveform or loads the selected arb waveform. |
| [2: POINTS] | Sets the number of points in a new arb waveform (8 to 16,000 points). |
| [3: LINE EDIT] | Performs a linear interpolation between two points in the arb waveform. |
| [4: POINT EDIT] | Edits the individual points of the selected arb waveform. |
| [5: INVERT] | Inverts the selected arb waveform by changing the sign of each point. |
| [6: SAVE AS] | Saves the current arb waveform in non-volatile memory. |
| 7: DELETE | Deletes the selected arb waveform from non-volatile memory. |

* The commands enclosed in square brackets ([]) are "hidden" until you make a selection from the NEW ARB command to initiate a new edit session.

D: SYSTEM MENU

1: OUT TERM ⇒ 2: POWER ON ⇒ ••• ⇒ 5: COMMA ⇒ 6: REVISION

- | | |
|-------------|--|
| 1: OUT TERM | Selects the output termination (50Ω or high impedance). |
| 2: POWER ON | Enables or disables automatic power-up in power-down state "0". |
| 3: ERROR | Retrieves errors from the error queue (up to 20 errors). |
| 4: TEST | Performs a complete self-test. |
| 5: COMMA | Enables or disables a comma separator between digits on the display. |
| 6: REVISION | Displays the function generator's firmware revision codes. |

E: Input / Output MENU

1: HPIB ADDR ⇒ 2: INTERFACE ⇒ 3: BAUD RATE ⇒ 4: PARITY ⇒ 5: LANGUAGE

- | | |
|--------------|---|
| 1: HPIB ADDR | Sets the GPIB bus address (0 to 30). |
| 2: INTERFACE | Selects the GPIB or RS-232 interface. |
| 3: BAUD RATE | Selects the baud rate for RS-232 operation. |
| 4: PARITY | Selects even, odd, or no parity for RS-232 operation. |
| 5: LANGUAGE | Verifies the interface language: SCPI. |

F: CALibration MENU *

1: SECURED ⇒ [1: UNSECURED] ⇒ [2: CALIBRATE] ⇒ 3: CAL COUNT ⇒ 4: MESSAGE

- | | |
|------------------|--|
| 1: SECURED | The function generator is secured against calibration; enter code to unsecure. |
| [1: UNSECURED] | The function generator is unsecured for calibration; enter code to secure. |
| [2: CALIBRATE] | Performs individual calibrations; must be UNSECURED. |
| 3: CAL COUNT | Reads the total number of times the function generator has been calibrated. |
| 4: MESSAGE | Reads the calibration string (up to 11 characters) entered from remote. |

* The commands enclosed in square brackets ([]) are "hidden" unless the function generator is UNSECURED for calibration.



- Square brackets ([]) indicate optional keywords or parameters.
- Braces ({ }) enclose parameters within a command string. Default parameters are shown in **bold**.
- Triangle brackets (< >) indicate that you must substitute a value for the enclosed parameter.

The APPLy Commands

(see page 138 in User's Guide)

APPLy

```
:SINusoid [<frequency> [, <amplitude> [, <offset>] ] ]
:SQUare [<frequency> [, <amplitude> [, <offset>] ] ]
:TRIangle [<frequency> [, <amplitude> [, <offset>] ] ]
:RAMP [<frequency> [, <amplitude> [, <offset>] ] ]
:NOISE [<frequency>|DEF> [, <amplitude> [, <offset>] ] ]
:DC [<frequency>|DEF> [, <amplitude>|DEF> [, <offset>] ] ]
:USER [<frequency> [, <amplitude> [, <offset>] ] ]
```

APPLy?

Output Configuration Commands

(see page 145 in User's Guide)

[SOURCE:]

```
FUNCTION:SHAPE {SIN|SQU|TRI|RAMP|NOIS|DC|USER}
FUNCTION:SHAPE?
```

[SOURCE:]

```
FREQUENCY {<frequency>|MIN|MAX}
FREQUENCY? [MIN|MAX]
```

[SOURCE:]

```
PULSE:DCYCLE {<percent>|MIN|MAX}
PULSE:DCYCLE? [MIN|MAX]
```

[SOURCE:]

```
VOLTage {<amplitude>|MIN|MAX}
VOLTage? [MIN|MAX]
VOLTage:OFFSet {<offset>|MIN|MAX}
VOLTage:OFFSet? [MIN|MAX]
VOLTage:UNIT {VPP|VRMS|DBM|DEF}
VOLTage:UNIT?
```

```
OUTPUT:LOAD {50|INF|MIN|MAX}
```

```
OUTPUT:LOAD? [MIN|MAX]
```

```
OUTPUT:SYNC {OFF|ON}
```

```
OUTPUT:SYNC?
```

Modulation Commands

(see page 154 in User's Guide)

[SOURCE:]

AM:DEPTH {<depth in percent> | MIN | MAX}
AM:DEPTH? [MIN | MAX]
AM:INTERNAL:FUNCTION {**SIN** | SQU | TRI | RAMP | NOIS | USER}
AM:INTERNAL:FUNCTION?
AM:INTERNAL:FREQUENCY {<frequency> | MIN | MAX}
AM:INTERNAL:FREQUENCY? [MIN | MAX]
AM:SOURCE {**BOTH** | EXT}
AM:SOURCE?
AM:STATE {OFF | ON}
AM:STATE?

[SOURCE:]

FM:DEVIATION {<peak deviation in Hz> | MIN | MAX}
FM:DEVIATION? [MIN | MAX]
FM:INTERNAL:FUNCTION {**SIN** | SQU | TRI | RAMP | NOIS | USER}
FM:INTERNAL:FUNCTION?
FM:INTERNAL:FREQUENCY {<frequency> | MIN | MAX}
FM:INTERNAL:FREQUENCY? [MIN | MAX]
FM:STATE {OFF | ON}
FM:STATE?

[SOURCE:]

BM:NCYCLES {<# cycles> | INF | MIN | MAX}
BM:NCYCLES? [MIN | MAX]
BM:PHASE {<degrees> | MIN | MAX}
BM:PHASE? [MIN | MAX]
BM:INTERNAL:RATE {<frequency> | MIN | MAX}
BM:INTERNAL:RATE? [MIN | MAX]
BM:SOURCE {**INT** | EXT}
BM:SOURCE?
BM:STATE {OFF | ON}
BM:STATE?

FSK Commands

(see page 167 in User's Guide)

[SOURCE:]

FSKey:FREQUENCY {<frequency> | MIN | MAX}
FSKey:FREQUENCY? [MIN | MAX]
FSKey:INTERNAL:RATE {<rate in Hz> | MIN | MAX}
FSKey:INTERNAL:RATE? [MIN | MAX]
FSKey:SOURCE {**INT** | EXT}
FSKey:SOURCE?
FSKey:STATE {OFF | ON}
FSKey:STATE?

Sweep Commands

(see page 170 in User's Guide)

[SOURCE:]

FREQuency:START {<frequency>|MIN|MAX}
FREQuency:START? [MIN|MAX]
FREQuency:STOP {<frequency>|MIN|MAX}
FREQuency:STOP? [MIN|MAX]

[SOURCE:]

SWEep:SPACing {**LIN**|LOG}
SWEep:SPACing?
SWEep:TIME {<seconds>|MIN|MAX}
SWEep:TIME? [MIN|MAX]
SWEep:STATe {OFF|ON}
SWEep:STATe?

Arbitrary Waveform Commands

(see page 174 in User's Guide)

[SOURCE:]

FUNcTION:USER {<arb name>|VOLATILE}
FUNcTION:USER?
FUNcTION:SHAPE USER
FUNcTION:SHAPE?

DATA VOLATILE, <value>, <value>, . . .

DATA:DAC VOLATILE, {<binary block>|<value>, <value>, . . . }

DATA:ATTRibute:AVERAge? [<arb name>]

DATA:ATTRibute:CFACTOR? [<arb name>]

DATA:ATTRibute:POINTs? [<arb name>]

DATA:ATTRibute:PTPeak? [<arb name>]

DATA:CATalog?

DATA:COpy <destination arb name> [, **VOLATILE**]

DATA:DELeTe <arb name>

DATA:DELeTe:ALL

DATA:NVOLatile:CATalog?

DATA:NVOLatile:FREE?

FORMat:BORDER {**NORMAL**|SWAPped} *Specify Byte Order*

FORMat:BORDER?

System-Related Commands

(see page 188 in User's Guide)

DISPlay {OFF|**ON**}

DISPlay?

DISPlay:TEXT <quoted string>

DISPlay:TEXT?

DISPlay:TEXT:CLear

SYSTem:BEEPer

SYSTem:ERRor?

SYSTem:VERSion?

*IDN?

*RST

*TST?

*SAV {0|1|2|3} *State 0 is the power-down state.*

*RCL {0|1|2|3} *States 1, 2, and 3 are user-defined.*

MEMory:STATe:DELeTe {0|1|2|3}

Triggering Commands

(see page 186 in User's Guide)

TRIGger:SOURce {**IMM**|EXT|BUS}

TRIGger:SOURce?

*TRG

Status Reporting Commands

(see page 209 in User's Guide)

SYSTem:ERRor?

*CLS

*ESE <enable value>

*ESE?

*ESR?

*OPC

*OPC?

*PSC {0|**1**}

*PSC?

*SRE <enable value>

*SRE?

*STB?

*WAI

Calibration Commands

(see page 193 in User's Guide)

CALibration?

CALibration:COUNT?

CALibration

```
:SECure:CODE <new code>
:SECure:STATE {OFF|ON}, <code>
:SECure:STATE?
```

CALibration:SETup <0|1|2|3|...|84>

CALibration:SETup?

CALibration:STRing <quoted string>

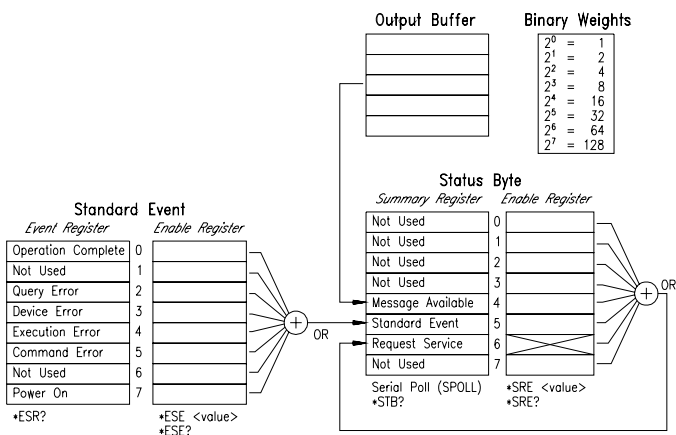
CALibration:STRing?

CALibration:VALue <value>

CALibration:VALue?

SCPI Status System

(see page 201 in User's Guide)



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IEEE-488.2 Common Commands

(see page 209 in User's Guide)

*CLS	*RST
*ESE <enable value>	*SAV {0 1 2 3}
*ESE?	*RCL {0 1 2 3}
*ESR?	*SRE <enable value>
*IDN?	*SRE?
*OPC	*STB?
*OPC?	*TRG
*PSC {0 1}	*TST?
*PSC?	*WAI

RS-232 Interface Commands

(see page 200 in User's Guide)

SYSTem:LOCal

SYSTem:REMOte

SYSTem:RWLock

For RS-232 wiring and connection information,
see page 195 in the User's Guide.

Phase-Lock Commands (Option 001)

(see the 33120A Option 001 User's and Service Guide)

PHASe:ADJust <radians>

PHASe:ADJust?

PHASe:REFerence

PHASe:UNLock:ERRor:STATe {OFF|ON}

PHASe:UNLock:ERRor:STATe?

OUTPut:TRIGger:IMMediate

OUTPut:TRIGger:STATe {OFF|ON}

OUTPut:TRIGger:STATe?

Simplified Programming Overview

Using the APPLy Command

The APPLy command provides the most straightforward method to program the function generator over the remote interface. For example, the following statement outputs a 3 Vpp sine wave at 5 kHz with a -2.5 volt offset:

```
"APPL:SIN 5 KHZ, 3.0 VPP, -2.5 V"
```

Using the Low-Level Commands

Although the APPLy commands provide the most straightforward method to program the function generator, the low-level commands give you more flexibility to change individual parameters. For example, the following statements output a 3 Vpp sine wave at 5 kHz with a -2.5 volt offset:

```
"FUNC:SHAP SIN"  
"FREQ 5.0 KHZ"  
"VOLT 3.0 VPP"  
"VOLT:OFFS -2.5 V"
```

Reading a Query Response

Only the query commands (commands that end with "?") will instruct the function generator to send a response message. Queries return either output values or internal instrument settings. For example, the following statements read the error queue and print the most recent error:

```
dimension statement  
"SYST:ERR?"  
bus enter statement  
print statement
```

Selecting a Trigger Source

When *burst modulation* or *frequency sweep* is enabled, the function generator will accept an immediate internal trigger, a hardware trigger from the rear-panel *Ext Trig* terminal, or a software (bus) trigger. By default, the internal trigger source is selected. If you want the function generator to use the external source or a bus trigger, you must select that source. For example, the following statements output a 3-cycle burst each time the *Ext Trig* terminal receives the rising edge of a TTL pulse:

```
"BM:NCYC 3"  
"TRIG:SOUR EXT"  
"BM:STAT ON"
```


Error Messages

*This is a **partial listing** of error messages. See chapter 5 in the User's Guide for more information.*

-102, "Syntax error" Check for blank space before or after a colon in command header, or before a comma.

-103, "Invalid separator" Check for a comma used instead of a colon, semicolon, or blank space – or a blank instead of a comma.

-108, "Parameter not allowed" Check for extra parameters in the command string.

-109, "Missing parameter" Check for omitted parameters in the command string.

-113, "Undefined header" Check the spelling of the command or you may have used an invalid command.

-221, "Settings conflict" The requested setting is in conflict with the present configuration.

-222, "Data out of range" Check for a numeric parameter value that is outside the valid range for the command.

-224, "Illegal parameter value" Check for an invalid discrete parameter choice for the command.

-330, "Self-test failed" The *TST? command failed.

-350, "Too many errors" More than 20 errors have occurred.

-410, "Query INTERRUPTED" The output buffer contains data from a previous command (the previous data is not overwritten).

781, "Not enough memory to store new arb waveform" Up to four user-defined waveforms can be stored in non-volatile memory. Use DATA:DEL to delete downloaded waveforms.

783, "Arb waveform name too long" The arb name can contain up to 8 characters. The first character must be a letter (A-Z), but the remaining characters can be number (0-9) or "_".

785, "Specified arb waveform does not exist" The arb name specified has not been downloaded into VOLATILE memory.

786, "Cannot delete a built-in arb waveform" You cannot delete the five built-in arb waveforms.

787, "Cannot delete the currently selected active arb waveform" You cannot delete the arb waveform that is currently being output.

Power-On and Reset State

The parameters marked with a bullet (•) are stored in *non-volatile* memory. The factory settings are shown.

Output Configuration

Function	Sine wave
Frequency	1 kHz
Amplitude (into 50 ohms)	100 mV peak-to-peak
Offset	0.00 Vdc
Output Units	Volts peak-to-peak
Output Termination	50 ohms

Modulation

AM Carrier Waveform	1 kHz Sine wave
AM Modulating Waveform	100 Hz Sine wave
AM Depth	100%
FM Carrier Waveform	1 kHz Sine wave
FM Modulating Waveform	10 Hz Sine wave
FM Peak Frequency Deviation	100 Hz
Burst Carrier Frequency	1 kHz Sine wave
Burst Count	1 cycle
Burst Rate	100 Hz
Burst Starting Phase	0 degrees
FSK Carrier Waveform	1 kHz Sine wave
FSK "Hop" Frequency	100 Hz Sine wave
FSK Rate	10 Hz
Modulation State	Off
Sweep Start / Stop Frequency	100 Hz / 1 kHz
Sweep Time	1 second
Sweep Mode	Linear

System-Related Operations

• Power-Down Recall	• Disabled
• Display Mode	• On
• Comma Separators	• On

Triggering Operations

Trigger Source	Power-On/Reset State Internal
----------------	----------------------------------

Input/Output Configuration

• GPIB Address	• 10
• Interface	• GPIB (IEEE-488)
• Baud Rate	• 9600 baud
• Parity	• None (8 data bits)

Calibration

Calibration State	Power-On/Reset State Secured
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NOTE: The power-on state will be different if you have enabled the power-down storage mode. See "Power-Down Recall Mode" on page 109 for more information.